

**WHAT IS CLAIMED IS:**

- 1 1. An article having an elastically stretchable fastening capability comprising an array of  
 2 loop-engageable fastening hooks on respective molded stems of thermoplastic resin that  
 3 rise from respective thermoplastic bases, the thermoplastic bases of the molded stems  
 4 being *in situ* laminated to the upper portion of a preformed carrier that comprises one or  
 5 more elastically stretchy layers, an extensible portion of the preformed carrier extending  
 6 beyond the array of hooks.
- 1 2. A flexible fastening comprising a relatively narrow array of loop-engageable fastening  
 2 hooks on respective molded stems of thermoplastic resin that rise from respective  
 3 thermoplastic bases, the thermoplastic bases of the molded stems being *in situ* laminated  
 4 to the surface structure of a flexible preformed carrier that comprises one or more  
 5 uniform layers defining hook-engageable loops, a flexible portion of the preformed  
 6 carrier extending beyond the array of hooks.
- 1 3. The article of claim 1 or 2 in which the array comprises at least one band or isolated  
 2 island of fastening hooks.
- 1 4. The article of claim 3 in which the band or isolated island comprises loop-engageable  
 2 hooks having crooks that individually point in a given respective direction.
- 1 5. The article of claim 4 in which groups of hooks in the band or isolated island have crooks  
 2 that point in opposite senses of a given direction.
- 1 6. The article of claim 5 in which said opposite senses are aligned with the direction of  
 2 extent of the band or of an elongated isolated island.
- 1 7. The article of claim 5 in which said opposite senses lie perpendicular to said direction of  
 2 extent.

1 8. The article of claim 3 in which the band or island comprises at least two closely adjacent  
2 parallel rows of hooks, the hooks in each row having crooks all aligned in the same  
3 direction.

1 9. The article of claim 3 in which the fastening hooks comprise molded stems having  
2 enlarged loop-engaging heads.

1 10. The article of claim 9 in which the heads comprise relatively flattened enlargements of  
2 molded stems.

1 11. The article of claim 1 or 2 in which the array of loop-engageable fastening hooks  
2 comprises a distribution of spaced apart islands of hooks on said molded stems.

1 12. The article of claim 11 in which regions of carrier free of the resin of which the hooks are  
2 comprised lie between spaced apart islands of hooks.

1 13. The article of claim 1 or 2 in which hooks of the array have molded stems that, at least in  
2 one direction, each taper outwardly to narrower dimension from a relatively wide width  
3 at its base.

1 14. The article of claim 13 in which loop-engageable molded loop-engaging heads are  
2 molded integrally with respective outer portions of the molded stems.

1 15. The article of claim 1 or 2 in which bases of groups of the hook stems are joined to  
2 common, substantially inextensible base layer portions.

1 16. The article of claim 15 in which the carrier has portions that are elastically stretchable in  
2 regions adjacent said base layer portions.

1 17. The article of claim 16 having at least one band of hooks and a characteristic machine  
2 direction corresponding to the direction in which the article moves during its

3 manufacture, the direction of extent of said band of hooks being aligned with said  
4 machine direction.

1 18. The article of claim 1 or 2 having a characteristic machine direction corresponding to the  
2 direction in which the article moves during its manufacture, the carrier being  
3 substantially inelastic in the machine direction and being elastically stretchable in the  
4 cross machine direction (direction normal to the machine direction).

1 19. The article of claim 1 or -- in which the carrier includes a layer of thermoplastic  
2 elastomer.

1 20. The article of claim 1 or -- in which the carrier is comprised of elastically stretchable  
2 textile.

1 21. The article of claim 1 or 2 in which the sheet-form carrier comprises multiple layers,  
2 including a pre-formed upper layer to which the bases of the stems are *in situ* laminated.

1 22. The article of claim 21 in which the sheet-form carrier includes a separately applied  
2 lower elastically stretchable layer.

1 23. The article of claim 1 or 2 comprising a frangible portion associated with the fastening  
2 hooks, adapted to be ruptured upon application of tension on the article, to enable the  
3 fastening hooks to move relatively freely with portions of the carrier on which they  
4 respectively reside.

1 24. The article of claim 1 or 2 comprising multiple parallel spaced apart bands of fastening  
2 hooks *in situ* laminated to the upper portion of said carrier, said bands constructed to flex  
3 relative to each other by flexing of intervening portions of said carrier upon application of  
4 distortion forces to the article.

1 25. The article of claim 1 or 2 in which the bases of molded stems of fastening hooks in  
2 adjacent bands or islands are formed as part of a common layer, slits extending along the  
3 sides of the bands or islands permitting relative movement of the respective bands or  
4 islands with the carrier.

1 26. The article of claim 1 or 2 in which there are regions between bands or islands of  
2 fastening hooks that are substantially devoid of thermoplastic resin of which the bases of  
3 the molded stems are comprised.

1 27. The article of claim 1 or 2 in which bands or islands of fastener hooks are comprised of at  
2 least two closely adjacent parallel rows of hooks.

1 28. The article of claim 1 or 2 in which the carrier has a surface comprised of stretchable  
2 nonwoven material.

1 29. The article of claim 28 in which the stretchable nonwoven material is associated with an  
2 elastomeric material that contributes to the elasticity of the carrier.

1 30. The article of claim 29 in which the elastomeric material is a binder distributed among  
2 fibers comprising said nonwoven material.

1 31. The article of claim 1 or 2 in which the carrier comprises a stretchable textile having at  
2 least one side which defines hook-engageable loops exposed for engagement by hooks.

1 32. The article of claim 31 in which the side which defines hook-engageable loops lies on the  
2 same side of the carrier as, and closely adjacent to, the array of hooks.

1 33. The article of claim 1 or 2 comprising multiple parallel spaced apart bands or rows of  
2 islands of fastening hooks *in situ* laminated to surface structure of said carrier, said bands  
3 or islands being free to move relative to each other.

1 34. The article of claim 33 in which the carrier is elastically stretchy enabling said bands or  
2 island to separate further from each other when said carrier is elastically stretched in the  
3 direction perpendicular to the extent of the bands or rows of islands, there being regions  
4 between the bands of fastening hooks that are substantially devoid of thermoplastic of  
5 which the bases of the molded stems are comprised.

1 35. The article of claim 1 or 2 in which said carrier comprises at least a textile component,  
2 there being portions of said textile component exposed between adjacent bands or islands  
3 of said loop-engageable fastening hooks.

1 36. The article of claim 35 in which said carrier is elastically stretchable.

1 37. The article of claim 35 in which said textile defines hook-engageable loops lying between  
2 said bands or island of hooks.

1 38. The article of claim 35 in which said textile defines a uniform field of hook-engageable  
2 loops lying on the side of said article opposite from the side from which said molded  
3 stems extend.

1 39. The article of claim 35 wherein the width of portions of said textile between adjacent  
2 bands or rows of islands of hooks is greater than the width of those bands or islands of  
3 hooks.

1 40. The article of claim 39 wherein said width of the textile portions is between two and five  
2 times greater than the width of said bands or islands of hooks.

1 41. The article of claim 39 wherein each band or island of hooks comprises at least two  
2 closely adjacent parallel rows of hooks.

1 42. The article of claim 41 in which there is a substantial multiplicity of rows of hooks in  
2 each band or island.

1 43. The article of claim 36 in which at least one textile layer is associated with an elastomeric  
2 material that contributes to the elasticity of the carrier.

1 44. The article of claim 43 in which the elastomeric material comprises a binder on the side  
2 of the textile opposite to the side on which the hook-engageable loops reside.

1 45. The article of claim 43 in which the elastomeric material comprises a sheet or film to  
2 which at least one layer of textile fiber is joined.

1 46. The article of claim 32 in which the textile comprises a stretchable nonwoven material  
2 that defines hook-engageable loops.

1 47. The article of claim 46 in which the nonwoven material comprises a needled batt of  
2 staple fibers which has been stretched substantially in one direction only, while the batt  
3 has been allowed to neck-in in the cross machine direction, the article including a binder  
4 that stabilizes the material in said stretched state, whereby the material is substantially  
5 elastically stretchable in only one direction corresponding to the direction in which it has  
6 not been stretched and stabilized in the stretched condition during manufacture.

1 48. The article of claim 47 in which the binder is a fluid binder applied to the back of the  
2 nonwoven material.

1 49. The article of claim 47 having a characteristic machine direction corresponding to the  
2 direction in which the article moves during its manufacture, the direction of the stabilized  
3 stretched state, in which the material is no longer stretchy being aligned with said  
4 machine direction.

1 50. The article of claim 33 in which the carrier has a width extending under multiple bands of  
2 said hooks, the bases of the molded stems of all the hooks being laminated *in situ* to the

carrier with multiple portions of the carrier lying between respective adjacent bands or rows of islands of hooks presenting hook-engageable loops, exposed to engage hooks.

51. The article of claim 33 in which the portions of the carrier extending between adjacent bands of hooks are discrete pre-formed bands of textile adjacent bands of hooks, having their molded stems laminated at their margins to surface structure of said bands of textile on one side, without the resin from which the stems are formed penetrating to the opposite side of the textile.

52. The article of claim 1 or 2 in the form of a fastener tab useful on a diaper, surgical gown, garment or wrap.

53. The article of claim 1 or 2 in the form of a fastenable wrapping.

54. The article of claim 1 or 2 in the form of a fastener tie.

55. The article of claim 1 or 2 in the form of a bundle tie.

56. The article of claim 1 or 2 in the form of an elastic fastener strap.

57. A method of forming the article of claim 1 or 2 comprising providing a mold roll having mold cavities constructed to form at least the stems of fastener hooks, introducing molten thermoplastic to the mold roll in a manner to fill the mold cavities from their stem ends and form a base layer for the stems, and, while the resin approaches or is on the roll, introducing a pre-formed sheet material in the manner that the bases of the stems are *in situ* laminated to surface structure of the pre-formed sheet material, the pre-formed sheet material either forming the entire carrier or, during the forming process, laminating a further layer to the layer to which the bases of the stems have been *in situ* laminated.

1 58. The method of claim 57 in which the mold roll has its mold cavities arranged to form  
2 discrete bands or rows of islands of loop-engageable hooks extending in the machine  
3 direction.

1 59. The method of claim 57 in which the pre-formed sheet material to which the bases of the  
2 stems are in situ laminated comprises a material which is elastically stretchable.

1 60. The method of claim 55 in which said material is elastically stretchy in only one  
2 direction, said direction lying perpendicular to the machine direction as it is introduced to  
3 the mold roll.

1 61. The method of claim 59 in which the elastically stretchable material includes at least a  
2 textile component.

1 62. The method of claim 61 in which the textile component comprises a stretchable  
2 nonwoven material that defines hook-engageable loops.

1 63. The method of claim 62 in which the nonwoven material comprises a needled batt of  
2 staple fibers which has been stretched substantially in one direction only while the batt  
3 has been allowed to neck-in in the cross machine direction, which the article including a  
4 binder that stabilizes the material in said stretched state, whereby the material is  
5 substantially elastically stretchable in only one direction corresponding to the direction in  
6 which it has not been stretched during manufacture.

1 64. The method of claim 57 in which the pre-formed sheet material is substantially inelastic  
2 in the machine direction and being elastically stretchable in the cross machine direction  
3 (direction normal to the machine direction).

1 65. The method of claim 57 in which the pre-formed sheet is substantially inelastic in both  
2 directions.



1 66. An elastically stretchable nonwoven hook-engageable loop material in which the  
 2 nonwoven material comprises a needled batt of staple fibers which has been stretched  
 3 substantially in one direction only while the batt has been allowed to neck-in in the cross  
 4 direction, the material including a binder which stabilizes the material in said stretched  
 5 state, whereby the material is substantially elastically stretchable in only one direction  
 6 corresponding to the direction in which it has not been stretched during manufacture.

1 67. A method of forming the nonwoven loop material of claim 66 comprising needling a batt  
 2 of staple fibers to produce fibers for engagement with hooks on one side, stretching the  
 3 needled batt substantially in only one direction, and including an elastomeric binder of  
 4 sufficient strength and quantity to stabilize the material in its stretched state and render it  
 5 elastically stretchable in the direction orthogonal to the direction of its stabilized,  
 6 stretched state.

1 68. The method of claim 67 in which the binder comprises a fluid binder which is applied to  
 2 the back of the material in a manner without penetrating to interfere with hook  
 3 engageability of loops on the opposite side of the material.

1 69. A composite comprising a loop-defining fabric of extended width and of uniform  
 2 construction to at least the surface structure of one side of which is *in situ* bonded, in at  
 3 least one region, at least one band or island of stems of loop-engageable hooks of plastic  
 4 resin adjacent a portion of said fabric being free of material of which said hooks are  
 5 formed.

1 70. The composite of claim 69 in which the composite comprises alternating parallel bands  
 2 or rows of islands of loop-engageable hooks, and regions or self-supporting hook-  
 3 engageable fabric, the uniform fabric extending continuously under and *in situ* bonded to  
 4 said bands or islands of molded stems of said hooks.

1 71. The composite of claim 70 in which the bands or islands of hooks are between about 1/8  
2 to 1/4 inch in width and intervening bands or regions of hook-engageable fabric are  
3 between about 1 and 5 times as wide as said hook bands or islands.

1 72. The composite of claim 69, 70 or 71 in which the fabric is elastic in the direction  
2 perpendicular to the direction of extent of the bands or rows of hooks.

1 73. The composite of claim 69, 70 or 71 in which the fabric is inelastic.

1 74. The composite of claim 69 configured as a medical or athletic wrapping.

1 75. A loop product for hook-and-loop fastening which is elastically stretchable substantially  
2 in one direction only, comprising  
3 a nonwoven fabric, in a pre-stretched state in one direction and necked in from its  
4 original state in the orthoginal direction as a result of the stretching, the fabric comprised  
5 of entangled fibers having front and back surfaces, the front surface having exposed,  
6 through-forced loops of said fibers extending therefrom capable of being engaged by  
7 hook-type fasteners and,  
8 an elastomeric binder securing the fibers in of the fabric, and stabilizing the pre-  
9 stretched state against stretching or relaxation in said one direction, resulting in the fabric  
10 being substantially elastically stretchable only in the orthogonal direction.

1 76. The loop product of claim 75 in which the binder is substantially confined to the side of  
2 said fabric opposite to the side from which said hook-engageable loops extend.

3 77. The loop product of claim 76 wherein the fabric is stabilized in a condition of at least 20  
2 percent pre-stretch in said one direction.

1 78. The loop product of claim 76 in which the fabric is stabilized in a condition of at least  
2 100 percent pre-stretch in said one direction.

1 79. A method of forming a stretchy loop product for a hook-and-loop fastener, the method  
 2 comprising the steps of forming a batt of loose, staple fibers;  
 3 entangling the fibers to produce a nonwoven fabric of fibers joined at  
 4 entanglements, with loops of some of the fibers extending from at least one side of the  
 5 fabric;  
 6 subsequently stretching the fabric in one direction to tighten the entanglements to  
 7 form knots while permitting the fabric to be relaxed and allowed to narrow in the  
 8 orthogonal direction, and  
 9 binding the knots with an elastomeric binder to stabilize the fabric against relaxing  
 10 from its stretched state, the resulting fabric being elastically stretchable substantially only  
 11 in the direction orthogonal to said one direction.

1 80. A hook fastener product having hook fasteners extending from molded stems that are  
 2 integrally formed with a flexible base layer, there being regions between adjacent hook  
 3 regions in which the material of the base layer is of lesser thickness than in the regions to  
 4 which the stems are integrally joined.

1 81. An apparatus for forming the product of claim 80 comprising a mold roll defined by a  
 2 series of rings including mold rings defining mold cavities for stems of fastener hooks  
 3 and spacer rings, the spacer rings having larger diameter than the mold rings, positioned  
 4 to form regions of reduced or eliminated thickness in resin introduced to the mold roll.

1 82. The apparatus of claim 81 in combination with a pressure roll toward which said larger  
 2 diameter rings extend to form said regions of reduced or eliminated thickness in resin.

1 83. An apparatus for applying molded fastener hooks or molded stems of fastener hooks to  
 2 the surface a preformed web or workpiece comprising a resin-receiving nip defined by a  
 3 mold roll having mold cavities defining said loop-engageable fastener hooks or stems of  
 4 said hooks and a pressure role, at least one of the rolls being cantilever supported over the  
 5 web or workpiece.